Short description

How to predict the sleep stage using electro-encephalogram (EEG) and accelerometer?

Challenge context

According to the American Agency of Sleep Medicine, there exists 5 sleep stages, called Wake, N1, N2, N3 and REM.

Dreem headband is able to acquire EEG signals using frontal electrodes as well as accelerometer data. Looking at these values, a doctor can determine the different sleep stages along a night. Nevertheless, this task is quite fastidious and time consuming.

We had our own doctor label nights, and aim now to automatically classify windows of 15 seconds.

Challenge goals

Brain in general and sleep in particular involve complex processes. The goal of this challenge is to be able to predict accurately sleep stages according to 15 seconds of EEG and accelerometer signals.

Data description

Note: All separators of the. csv files are commas.

TRAINING INPUT:

The training dataset is composed of 31129 windows of 15 seconds of nights. The first row will give you the headers, and the first column corresponds to IDs of the windows. Each point is in dimension 4203, distributed this way:

- SLEEPER\_ID (int): id of the sleeper

- SIGNAL\_ID (int): id of the signal. You have full nights at your disposal, and are able to rebuild it.

\_ IDX\_IN\_NIGHT (int): index of the window in the night. Please note that each night may not be continuously present as we withdrew bad quality signals

- 3750 \* EEG (float): 15-second electro-encephalogram signal, sampled at 250Hz. This is the raw signal acquired by electrodes, where we only cut 50 and 62,5Hz frequencies and applied a high-pass filter at 0,4Hz

- 150 \* ACC\_X (float): 15-second of accelerometer data in direction x. We initially had 3750 points (250Hz), but convolved with a Gaussian and then subsampled at 10Hz

- 150 \* ACC\_Y (float): idem in direction y

- 150 \* ACC\_Z (float): idem in direction z

TRAINING OUTPUT:

The training labels correspond to the 5 acknowledged sleep stages (all integers):

- 0: Wake

- 1: N1, sometimes said "light sleep" or "somnolence". Quite rare along the night

- 2: N2, sometimes said "intermediate sleep", the major stage

- 3: N3, or "deep sleep"

- 4: REM, for "Rapid eye movement", also said "paradoxical sleep". This is the stage when dreams occur

YOUR RESULTS:

The file you submit should look like this:

ID,TARGET

ID00001,2.0

ID00002,4.0

ID00003,3.0

...

The targets are integer between 0 and 4.

EVALUATION METRICS:

The metrics used to evaluate your algorithm is:

Score = (1+ Cohen's kappa coefficient)/2.

The Cohen Kappa coefficient measures the agreement between two judges by taking chance into account. You will find easy explanations on the web if you are interested, otherwise, in order to have an idea of your performance, you can keep the following scale in mind for the kappa coefficient:

< 0: Disagreement

0.0 - 0.20: Very weak agreement

0.21 - 0.40: Weak agreement

0.41 - 0.60: Moderate agreement

0.61 - 0.80: Strong agreement

0.81 - 1.00: Almost perfect agreement